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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte AVGERINOS V. GELATOS, OLKAN CUVALCI, TONG
ZHANG, and CHEN-AN CHEN

Appeal 2008-003319
Application 10/792,054
Technology Center 3700

Decided:¹ June 30, 2009

Before JENNIFER D. BAHR, LINDA E. HORNER, and STEVEN D.A.
McCARTHY, *Administrative Patent Judges*.

BAHR, *Administrative Patent Judge*.

DECISION ON APPEAL

¹ The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

STATEMENT OF THE CASE

Avgerinos V. Gelatos et al. (Appellants) appeal under 35 U.S.C. § 134 from the Examiner's decision rejecting claims 1-24. Claims 25-31 have been withdrawn. We have jurisdiction over this appeal under 35 U.S.C. § 6 (2002).

The Invention

Appellants' claimed invention is directed to a support for substrates in a substrate processing chamber. For example, the substrate may be a semiconductor fabricated in a semiconductor processing chamber using a chemical vapor deposition (CVD) process. Specification 2:8-11. Substrate support 20 is made of a ceramic block 28 with a top surface 22 having a receiving pocket 24 that holds substrate 21 during processing. Specification 6:5-10. Because the various surfaces of ceramic block 28 are subject to corrosion from gases present during processing (Specification 6:22-25), a ceramic coating 40 is placed over block 28; coating 40 being made of a different ceramic material than block 28 (Specification 7:1-5). The ceramic coating 40 can be, for example, silicon nitride (Si_3N_4), or an amorphous Si-N-H-O compound. Specification 9:1-2, 12-16.

Claim 1, reproduced below, is illustrative of the claimed invention.

1. A substrate support for a substrate processing chamber, the substrate support comprising:
 - (a) a ceramic block having a substrate receiving pocket that is sized to receive a substrate therein, a peripheral ledge extending about the substrate receiving pocket, and side surfaces;
 - (b) a ceramic coating covering the substrate pocket and peripheral ledge of the ceramic block, the ceramic coating comprising an amorphous Si-H-N-O compound;

(c) a resistance heater in the ceramic block;
and
(d) heater leads extending out of the ceramic block to conduct electrical power to the resistance heater.

The Rejections

The Examiner relies upon the following as evidence of unpatentability:

Berkman	US 4,090,851	May 23, 1978
Ishii	US 5,851,298	Dec. 22, 1998
Chang	US 5,916,370	Jun. 29, 1999
Hwang	US 6,009,831	Jan. 4, 2000
Brown	US 6,046,758	Apr. 4, 2000
Tachikawa	US 6,376,808 B2	Apr. 23, 2002
Chen	US 6,423,949 B1	Jul. 23, 2002
Burkhart	US 6,469,283 B1	Oct. 22, 2002
Todd	US 6,630,413 B2	Oct. 7, 2003

Appellants seek review of the Examiner's rejections under 35 U.S.C. § 103(a) of claims 1-5, 7, 8, 11-15, and 17 as unpatentable over Chen in view of Chang or Berkman, and either Brown or Todd; claims 6, 9, and 16 as unpatentable over Chen in view of Chang or Berkman, Brown or Todd, and Burkhart or Tachikawa; and claims 10 and 18-24 as unpatentable over Chen in view of Chang or Berkman, Brown or Todd, and Ishii or Hwang².

SUMMARY OF DECISION

² The Examiner relies on alternative references in making these rejections. However, we will focus our attention on Chen, Chang, and Todd in reviewing these rejections.

We AFFIRM.

ISSUE

In rejecting claims 1-5, 7, 8, 11-15, and 17, the Examiner concluded, in relevant part, that it would have been obvious to take a ceramic block with a resistive heater that holds substrates in a substrate processing chamber, as described in Chen, and to coat the ceramic block with a protective barrier, as described in Chang, the coating being a particular amorphous Si-H-N-O compound, as described in Todd. Ans. 3-4.

Appellants argue that the subject matter of claims 1-5, 7, 8, 11-15, and 17 is not obvious in view of Chen, Chang, and Todd. Appellants first argue that Chen, Chang, and Todd do not render obvious the subject matter of claim 1. App. Br. 8-11. Specifically, Appellants argue that Chen does not provide motivation for providing a protective coating for its ceramic block (App. Br. 8); that Chang teaches away from using an amorphous Si-H-N-O coating and does not disclose a resistance heater (App. Br. 9); and that Todd does not provide motivation to apply its amorphous Si-H-N-O coating to the ceramic block in Chen (App. Br. 10-11). Appellants do not present any separate arguments for claims 2-5, 7, and 8. Appellants separately state that Chen, Chang, and Todd do not render obvious the subject matter of claims 11-15 and 17, but rely on the same arguments as provided for claim 1 above. App. Br. 11-13. Therefore, claims 2-5, 7, 8, 11-15, and 17 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(vii).

Next, Appellants argue that the subject matter of claims 6, 9, and 16 is not obvious in view of Chen, Chang, Todd, and Burkhart or Tachikawa. However, Appellants' arguments are the same arguments as provided for

claim 1 above, with the further assertion that Burkhart and Tachikawa do not cure the alleged deficiencies of Chen, Chang, and Todd. App. Br. 13-15.

Finally, Appellants argue that the subject matter of claims 10 and 18-24 is not obvious in view of Chen, Chang, Todd, and Ishii or Hwang. However, Appellants' arguments are the same arguments as provided for claim 1 above, with the further assertion that Ishii and Hwang do not cure the alleged deficiencies of Chen, Chang, and Todd. App. Br. 15-19.

The dispositive issue presented in this appeal is whether Appellants have demonstrated that the Examiner erred in rejecting claim 1 (and by dependency, claims 2-24) as unpatentable under 35 U.S.C. § 103(a) by concluding that Chen, Chang, and Todd, in combination, render obvious the subject matter of claim 1 as a whole. In particular, the issue is whether the Examiner has provided reasoning with rational underpinning for coating the ceramic block described in Chen with a protective coating, as described in Chang, the protective coating being Si-H-N-O, as described in Todd.

**FACTS PERTINENT TO THE ISSUES
(FINDINGS-OF-FACT (FF))**

FF1 Chen describes a support for a substrate in a chemical vapor deposition (CVD) apparatus. Col. 5, ll. 57-63. A ceramic block (susceptor 155) holds a substrate inside CVD chamber 145, and heats the substrate with a plurality of resistance heaters 250 and 260 located inside the ceramic block 155. Col. 6, ll. 26-29, 32-36, col. 7, ll. 48-50, col. 8, ll. 34-39, fig. 1.

FF2 The Examiner found that Chen does not describe a ceramic coating for the ceramic block 155. Ans. 3.

FF3 Chang describes a diamond film 150 used to protect a ceramic block (susceptor 144) from etchants within a semiconductor processing chamber 102. Col. 2, ll. 46-52, col. 3, ll. 8-12.

FF4 The diamond film 150 described in Chang is substantially inert to most etchants (col. 3, ll. 8-12), thereby protecting the underlying ceramic block 144 from the corrosion caused by the etchants that are used to clean the processing chamber 102 (col. 1, ll. 36-56).

FF5 Chang does not describe that the diamond film 150 is made of silicon nitride or an amorphous Si-H-N-O compound.

FF6 Todd describes an amorphous silicon nitride compound that is useful for preventing oxidation and diffusion, as well as useful as a hardmask in etch process steps. Col. 12, ll. 34-43. Because etching is a process in which areas of a substrate are selectively removed via corrosion, the areas of the substrate that are not to be removed (corroded) must be protected by a material resistant to corrosion from exposure to such etchant, commonly known in the art as a mask or hardmask.

FF7 The Examiner found that Todd describes an amorphous silicon nitride compound preferably made of (by approximate wt%): 40-99.5% Si, 0.25-40% N, 0-49.9% O, and <=20% H. Ans. 3-4, *see also* Todd, table 1, and col. 4, ll. 39-43.

FF8 Chang describes silicon nitride to be a problem in reactor chambers. When used in a high temperature nitride process (e.g. CVD), the silicon nitride is deposited on the wall of the chamber in addition to its intended target, such that the deposits can eventually build up and flake off, contaminating the chamber. Col. 1, ll. 34-41.

FF9 Todd describes the term "silicon nitride" as not a particular chemical composition, but rather a general term indicating only that a particular compound contains at least silicon and nitrogen. Col. 4, ll. 11-27. As such "silicon nitride" refers to a broad array of different chemical compositions.

FF10 The particular chemical composition of a "silicon nitride" compound is adjustable to provide suitable resistance to the various corrosive gases in a semiconductor manufacturing environment. Specification 9:14-16.

PRINCIPLES OF LAW

In obviousness determinations, all of the features of the secondary reference need not be bodily incorporated into the primary reference. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Moreover, the artisan is not compelled to blindly follow the teaching of one prior art reference over the other without the exercise of independent judgment. *See Lear Siegler, Inc. v. Aeroquip Corp.*, 733 F.2d 881, 889 (Fed. Cir. 1984).

While the requirement for a teaching, suggestion, or motivation (the TSM test) to combine known elements in order to show that the combination would have been obvious may be "a helpful insight," it cannot be used as a rigid and mandatory formula. *KSR Int'l. Co. v. Teleflex Inc.*, 550 U.S. 398, 418-19 (2007).

Rejections on obviousness grounds must be supported by "some articulated reasoning with some rational underpinning" to combine the known elements in the manner required in the claim at issue. *Id.* at 418. However, "the analysis need not seek out precise teachings directed to the

specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *Id.*

"[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." *Id.* at 417.

The selection of a known material based upon its suitability for the intended use is a design consideration within the skill of the art. *In re Leshin*, 277 F.2d 197, 199 (CCPA 1960).

When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103.

KSR, 550 U.S. at 421.

ANALYSIS

The Examiner found that Chen describes each element of claim 1 (*see* FF1), except for the amorphous Si-H-N-O compound used as a ceramic coating for the ceramic support block (FF2). Ans. 3. Next, the Examiner found that Chang describes the use of a protective coating for a ceramic block (*see* FF3, FF4), but ostensibly not an amorphous Si-H-N-O compound (*see* FF5). Ans. 3. However, the Examiner found that Todd describes the

use of an amorphous Si-H-N-O compound with desirable protective properties. Ans. 3-4; FF7, *see* FF6. Therefore, the Examiner concluded that it would have been obvious to coat the ceramic block in Chen with a protective coating, as described in Chang, the coating being a corrosion-resistant compound, as described in Todd, to provide a mechanically and chemically strong protective coating for the ceramic block. Ans. 4.

Appellants' first argument, that Chen does not provide motivation for coating the ceramic block (App. Br. 8), is not found persuasive. The Examiner need not establish motivation in order to demonstrate obviousness. *KSR*, 550 U.S. at 418-19. In this case, the Examiner found in Chang, not Chen, the rationale for using a protective coating on the block in Chen. *See* Ans. 3-4.

Appellants' second argument, that Chang teaches away from using an amorphous Si-H-N-O coating (App. Br. 9), is not found persuasive. Chang does not teach away from using the amorphous Si-H-N-O coating. The record indicates no passage in Chang that criticizes, discredits, or otherwise discourages the use of an amorphous Si-H-N-O. *See In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004) ("[M]ere disclosure of alternative designs does not teach away.").

Furthermore, while Chang does describe problems with silicon nitride flaking in a processing chamber, Chang is talking about flakes forming from the use of silicon nitride in a *deposition* context (such as CVD), not in the present *prophylactic* context. *See* FF8. As such, Chang says nothing as to the particular suitability of silicon nitride as a protective barrier for ceramic blocks in semiconductor processing chambers. Given that the term "silicon nitride" is generic to a genus of particular compounds (*see* FF9), with the

particular chemical composition of "silicon nitride" having a great influence on the ability of the "silicon nitride" to withstand particular corrosive etchants (*see* FF10), it cannot be said that Chang's brief discussion of depositing silicon nitride in a CVD process is relevant in any way to the usage of silicon nitride as a barrier for ceramic blocks.

Appellants' third argument, that Chang does not disclose a resistance heater (App. Br. 9), is not found persuasive. Chang was not used by the Examiner to disclose a resistance heater; the Examiner found that feature in Chen. *See* Ans. 3.

Appellants' final argument, that Todd does not provide a teaching or motivation to apply its amorphous Si-H-N-O coating to the ceramic block in Chen (App. Br. 10-11), is not found persuasive. Appellants state that the disclosure of a type of coating does not teach the use of that coating in a particular application. App. Br. 11. However, the selection of a known material based upon its suitability for the intended use is a design consideration within the skill of the art. *In re Leshin*, 277 F.2d 197, 199 (CCPA 1960). Todd describes that the disclosed Si-H-N-O materials are suitable for use as masks to protect against chemical damage such as oxidation and diffusion from etchants. FF6. The materials described by Todd thus are known for their resistance to corrosion from etchants. *Id.* The Examiner states that one of ordinary skill would use the amorphous Si-H-N-O composition in Todd for its intended use: to chemically protect the ceramic block in Chen. Ans. 4. Therefore, the selection of Todd's composition is merely the selection of a known material, based upon its suitability to solve the very same corrosion problem the material was known to solve. The selection of such a composition, from among a finite number

of identified, predictable compositions with suitable properties, involves ordinary skill and common sense, not innovation. *See KSR*, 550 U.S. at 421.

CONCLUSIONS

Appellants have not demonstrated that the Examiner erred in rejecting claim 1 as unpatentable under 35 U.S.C. § 103(a) by concluding that Chen, Chang, and Todd, in combination, render obvious the subject matter of the claim as a whole. In particular, the Examiner has provided reasoning with rational underpinning for coating the ceramic block described in Chen with a protective coating, as described in Chang, the protective coating being an amorphous Si-H-N-O compound, as described in Todd.

Likewise, Appellants have not demonstrated error in the rejections of claims 2-5, 7, 8, 11-15, and 17 as unpatentable over Chen, Chang or Berkman, and Brown or Todd; claims 6, 9, and 16 as unpatentable over Chen, Chang or Berkman, Brown or Todd, and Burkhart or Tachikawa; and claims 10 and 18-24 as unpatentable over Chen, Chang or Berkman, Brown or Todd, and Ishii or Hwang.

DECISION

The Examiner's decision is affirmed as to claims 1-24.

AFFIRMED

Appeal 2008-003319
Application 10/792,054

mls

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